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NPIC/D-237/70

7 AUG 1970

MEMORANDUM FOR: Deputy Director of Central Intelligence

THROUGH : Executive Director-Comptroller
Director, Office of Planning, Programming and
Budgeting
Deputy Director for Intelligence *Euph*

SUBJECT : Approval to Conduct an Imagery Interpretation
Research Program with [REDACTED]
[REDACTED] from FY-1971 R&D Funds

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1. This memorandum requests approval for the commitment of funds for an NPIC contract. The specific request is stated in paragraph 10.

2. NPIC has contracted with [REDACTED]
[REDACTED] since FY-1966 to develop the Center's Imagery Interpretation Research Program. Primary areas of research interest have been concerned with:

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--providing the Center's R&D engineers the required support to incorporate thorough human factors design and evaluation techniques in major NPIC exploitation hardware developments.

--maintaining the reconnaissance community's most comprehensive literature review and documentation file of photo-interpretation-related literature, available to the community within the bounds imposed by security considerations.

--developing a wide range of personnel performance measures to aid personnel selection, evaluate training programs and techniques, determine equipment adequacy, and judge and improve the quality of the Center's products.

--combining [REDACTED] appreciation of the Center's capabilities and limitations with their acknowledged expertise in human factors aspects of photointerpretation to assist the Center in planning its future human resource needs.

--augmenting the optical industry's nearly exclusive concern with geometric and physical optics with research

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in the human visual aspects of photointerpretation, the aim of which is to establish design criteria for magnification aids compatible with the capabilities and limitations of the human visual/perceptual system.

3. Charged with a primary responsibility to respond to every advance in the aerial reconnaissance state-of-the-art, and limited in terms of the manpower with which it can operate, NPIC has accepted the challenge to improve upon its current assets in order to carry out its obligations. One approach has been to determine the ways and means of automating many of its activities. For those tasks that require the human element, the technique has been to improve and expand the very unique capabilities of its personnel. Clearly, the [REDACTED] contract has been one of the mainstays in the Center's efforts to enhance the total efficiency of an operation that will undoubtedly continue to be heavily dependent upon humans.

4. The Imagery Interpretation Research Program has produced tangible results, and they have been appreciated. In fact, individual Center components, other Government agencies, as well as industrial organizations, have increasingly sought the assistance of the Center's in-house and contractual human factors capabilities, to such an extent of late that requests are often turned down for lack of time, manpower and funding. Recently, several Government and industrial components associated with the Center have begun to develop their own human factors capabilities, and there is expected to be an even greater reliance upon, and development of, this discipline in the future. Meanwhile, it appears that NPIC must carry the burden for the reconnaissance community in this area of research.

5. Several accomplishments of the most recent [REDACTED] contract were:

--Mensuration Accuracy Statements - [REDACTED] and the NPIC Photogrammetry Division jointly determined the Center's official horizontal mensuration accuracy statements for the high resolution, spotting camera acquisition system. Two error prediction equations were developed from data

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collected in an earlier [redacted] Center mensuration study -
one for targets [redacted] to 1000 feet in length, the other
for targets less than [redacted] in length. Every official
NPIC measurement now quotes these accuracy estimates.

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--Mensuration Training - A mensuration training package was developed for the Photogrammetry Division to help improve the mensuration ability of new comparator operators, be they photointerpreters or photogrammetrists. Pointing accuracy tests, developed simultaneously with the training package, will determine when students qualify for precise operational mensuration tasks.

--Assessment of PI Target Knowledge - A target recognition test was developed and administered to Imagery Exploitation Group photointerpreters for the purpose of identifying those target types which interpreters found most difficult to recognize. Once these performance deficiencies were identified, the targets of highest intelligence priority were selected for inclusion in the training program discussed below.

--Target Recognition Training - Training packages on 18 of these high priority operational targets were developed for the use of the Imagery Exploitation Group. Results to date indicate appreciable performance improvement as well as broad interpreter acceptance.

--Validation of Area Specialist Performance - Two PI performance tests, one on searching ability and the other on reasoning ability, previously administered to Center photointerpreters in 1967, were readministered in 1969. This program had as its major objective assessment of the impact of a reorganization within IEG which emphasized area rather than target specialization among PI's; a reorganization initiated in response to a shift in national requirements from one limited primarily to specific targets to current emphasis on large geographic areas. Extensive improvements were found in search performance resulting from the reorganization, whereas no such change in reasoning ability was evident. However, the data did reveal that the Offutt PI course, in which the Center enrolls most of its new interpreters, offered very effective training in the

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reasoning area. Participation in the three month course was found to be equivalent to approximately 2 1/2 years of on-the-job training for tasks such as those measured in the tests.

--Microscope Design Criteria (Convergence Angle) - A reliable and measurable indication of at least one form of visual anomaly related to the use of microscopes was discovered. Of significant interest to the medical profession as well as to the Center, unexpectedly large fluctuations of the visual focusing system during a static visual task were noted in the course of a basic research program devoted to establishing design criteria for microscopes - design criteria which take into account physiological optics and readout requirements along with the typical physical parameters of interest to the optics industry.

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--TICOF Support - [REDACTED] provided procedural plans in support of the Technology Integration and Checkout Facility (TICOF), a work area where PI operations and equipment are monitored on a non-interference basis by video, audio, and electronic surveillance. One of the results from the program led to a comprehensive evaluation of light table utilization and long-term lighting characteristics of the tables. These results, in turn, have resulted in a Center decision to thoroughly re-evaluate basic design concepts of our increasingly more expensive and complex viewing systems, with special emphasis placed upon physiological and work-oriented considerations.

--Equipment Development Support - This task included several equipment design support functions, such as human factors evaluation of NPIC-developed equipment items, identifications of current and near-future exploitation hardware modification requirements, and revision of the Center's specification for the writing of operator instruction and maintenance manuals.

6. The proposed investigation will consist of five rather broad research categories which have been selected from a sub-

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stantial list of potentially valuable research areas. This selection process was accomplished by in-house R&D and operational personnel with the cooperation of NPIC's human factors consultants panel. The five areas have been selected only after a thorough review of past [REDACTED] achievements and future Center requirements. Several proposed tasks are similar in nature to, but quite independent of the results of, tasks conducted on each of the previous [REDACTED] contracts. Such is the case because each new hardware development, for example, requires some form of human factors support. In other instances, however, the proposed work represents the culmination of earlier research programs, such as the task to produce a production version of a monoscopic/stereoscopic visual acuity test for personnel selection and equipment evaluation. More than a year's worth of research has already been devoted to the development of this test. The proposed contract also includes tasks primarily responsive to recently-generated human factors research requirements, such as the evaluation of the influence of color imagery on the observer's visual system and the equipment he employs.

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7. The specific proposed research areas are:

a. Interpretation/Mensuration Support [REDACTED] a multi-purpose program that includes a study to determine techniques to improve the search for new targets, as well as to enhance the ability to detect change within known target or target areas [REDACTED]. A second task will be concerned with validating Target Recognition Training packages developed under the present contract and preparing additional recognition packages for high priority targets [REDACTED]. A further study will be devoted to the development of a design for an advanced imagery viewing system that is maximally sensitive to PI use requirements, and is in strict accord with visual/perceptual considerations, [REDACTED]. Finally, human factors consultation will be provided the Center in such areas as mensuration accuracy, determination of target color signatures, and in-house PI training. [REDACTED]

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b. Equipment Development Support [REDACTED], a continuing task devoted to assisting the Center's equipment development, test and evaluation programs by applying human factors principles and preparing and conducting evaluation programs. This effort will rest heavily upon [REDACTED] knowledge of PI tasks, procedures, and psychological as well as physical capabilities and limitations. 25X1

c. Photointerpreter Vision Research [REDACTED], which includes an effort designed to develop stereoscopic vision tests suitable for Center application in the areas of personnel testing and equipment evaluation [REDACTED]. This task also includes a comprehensive study of the effects of color imagery on visual and equipment performance [REDACTED]. 25X1

d. Image Quality/PI Performance Correlation [REDACTED] programmed to apply a [REDACTED] developed model for evaluating image quality of black and white film to the performance of photointerpreters. The aim of this research is to devise a means of relating interpreter performance to objective image characteristics, thereby allowing the Center to predict the effects upon information extraction of a modification to the acquisition system. 25X1

e. State-of-the-Art Review [REDACTED], a continuation of past programs wherein a thorough literature review and compilation of articles relevant to the human factors in photointerpretation is accomplished. 25X1

8. This project has been coordinated with DDS&T and the COMIREX Internal Coordination Research & Development Subcommittee, in addition to the coordinated review described in Paragraph 6. It does not duplicate any other known work.

9. It is considered desirable to maintain a relatively constant level of effort with [REDACTED]. The Center environment is likely to be in continuous change with the advent of new imagery and equipment in the near future. Prospects for useful results from this research are remarkably high, in terms of both the actual findings and data achieved and the progress made in applying these results. 25X1

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10. It is requested that approval be granted for negoti-
ation with [REDACTED] for a contract to conduct the
described program at a cost not to exceed [REDACTED] (including
a 10% target fee) from Category I FY-1971 R&D Funds.

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Captain, USN
Acting Director
National Photographic Interpretation Center

Attachments:

1. Proposal
2. Form 2420

CONCUR:

[REDACTED]
Assistant Deputy Director for Intelligence

12 AUG 1970

Date

APPROVED:

787 L. K. White

Deputy Director of Central Intelligence

Executive Director

1 SEP 1970

Date

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